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## (54) Disposable diaper

(57) A disposable diaper comprises an absorbent core (1) of a desired thickness, a water-permeable topsheet (2) covering at least an upper surface of the core (1), a waterproof or a water-impervious backsheet (3) covering at least a bottom surface of the core (1), water-impervious side flaps (4) extending outwardly of opposite sides of the core (1), first elastic bands (5) adapted to form elastic gathers longitudinally of the respective flaps (4) and leakage protecting baffles (6) formed along opposite side edges of the core (1) and containing second elastic bands (9) to provide elastic gathers longitudinally thereof.

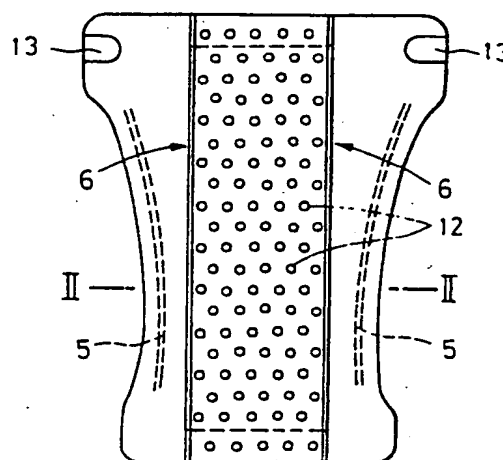
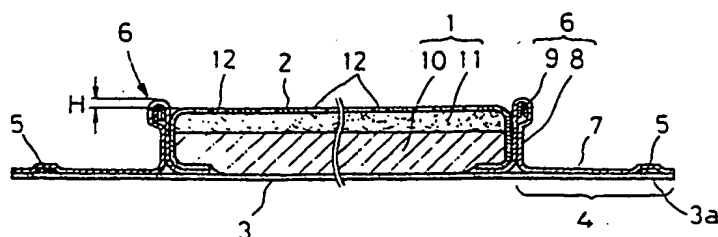


FIG.2



The drawings originally filed were informal and the print here reproduced is taken from a later filed formal copy.

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FIG.1

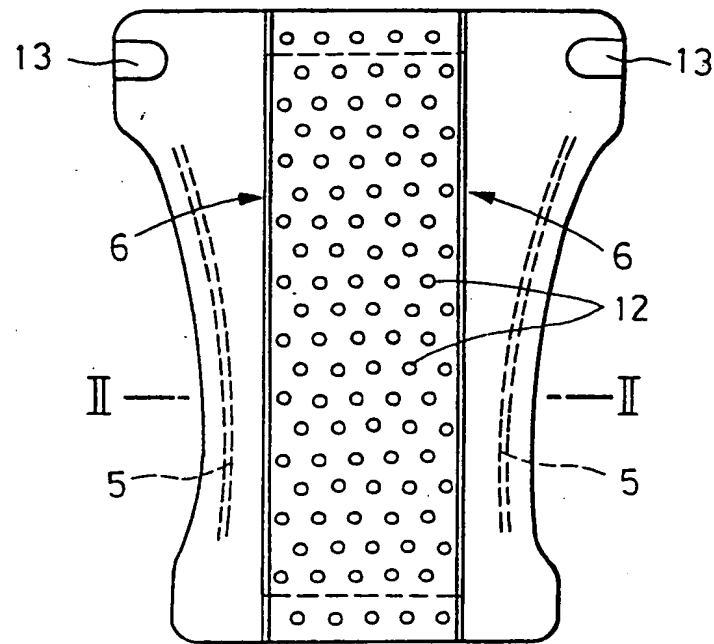
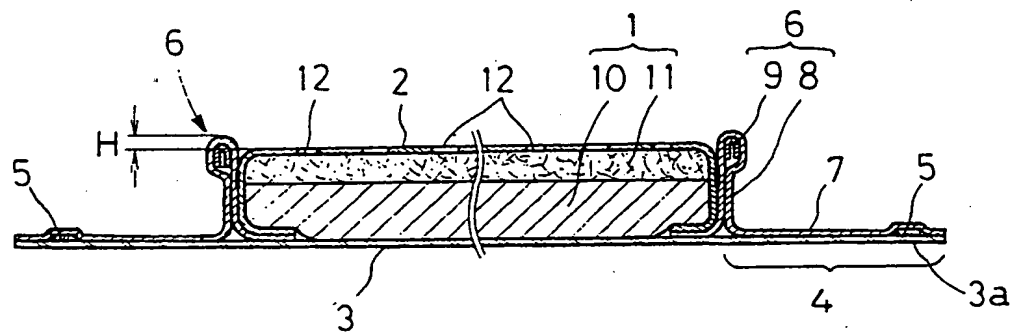


FIG.2



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FIG.3

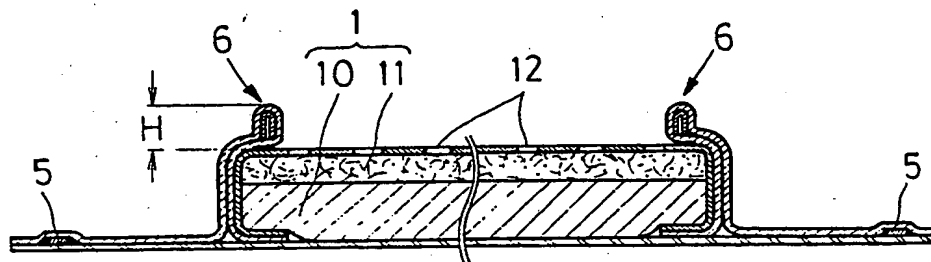
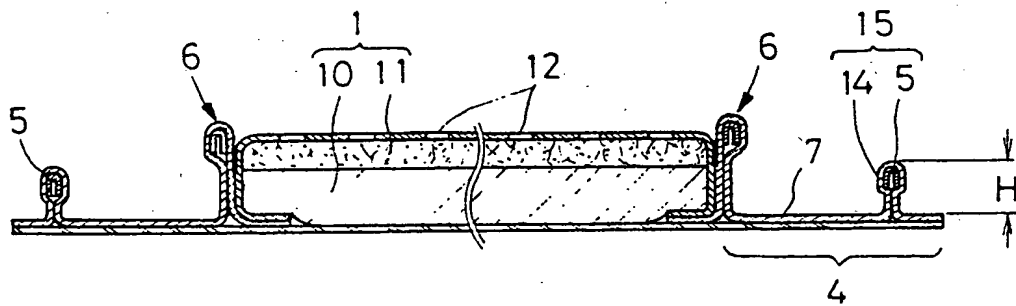


FIG.4



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FIG.5

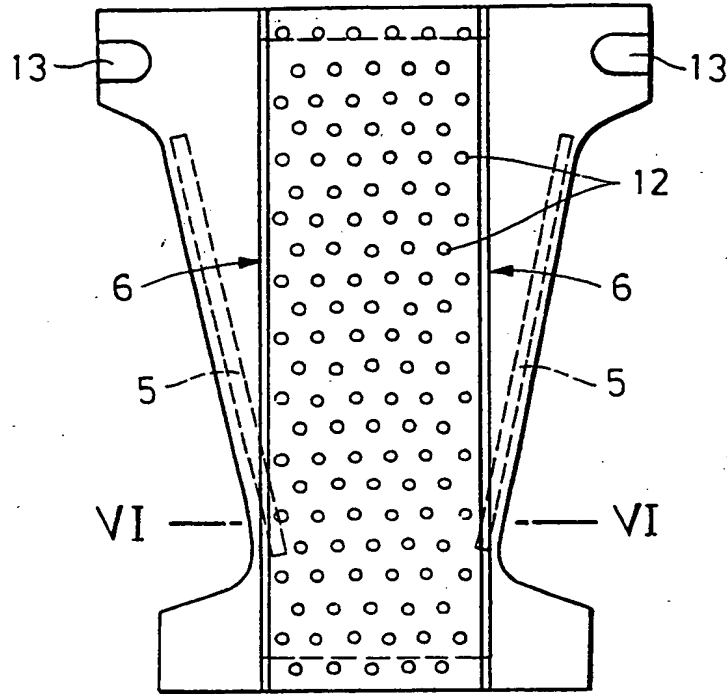


FIG.6

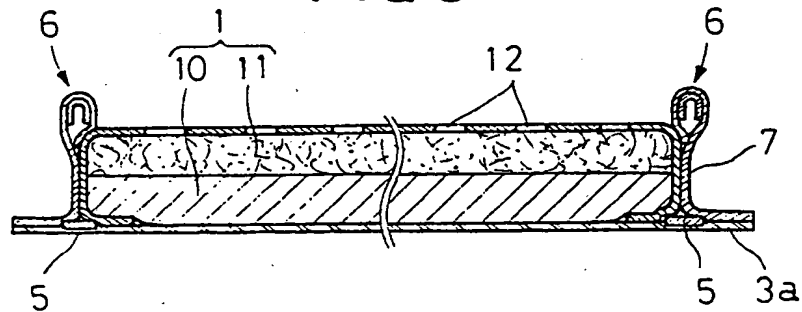
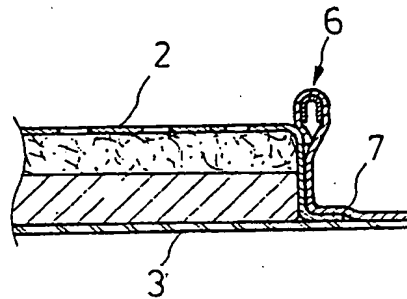


FIG.7



## SPECIFICATION

## Disposable diaper

5 The present invention relates to a disposable diaper and particularly to such diaper characterized by a structure for prevention of excretion leakage.

French Patent Publication No. 2,388,515  
10 discloses a disposable diaper having no side flaps closely surrounding the thighs of a wearer, wherein opposite sides of an impervious backsheet extending on the underside of an absorbent core are folded upward so as to  
15 cover opposite sides of said core and opposite side edges of a pervious topsheet are provided longitudinally of them as well as flatly thereon with elastic bands to form gath-  
20 ers. The invention on which this patent application is based essentially resides in that the respective zones of said topsheet and said backsheet in which said elastic bands adhere to both these sheets are set free from said  
25 core and thereby the elasticity of said elastic bands is relieved of a restricting effect exerted by the rigidity of said core.

U.S. Patent No. 4,579,556 discloses an absorbent article such as a disposable diaper having side flaps closely surrounding the  
30 thighs of a wearer, wherein said flaps are formed by folding opposite sides of an impervious backsheet disposed on the underside of an absorbent core so as to extend outwardly of opposite side edges of said core and then  
35 fastening said folded side edges to a pervious topsheet disposed on the upper side of said core and wherein said flaps are provided with elastic bands which are elastic longitudinally of  
40 said flaps so that said flaps are raised by the elasticity of said bands along zones adjacent said core. This invention generally resides in that body fluids are prevented from leaking  
45 out along the opposite side edges of said core and the fitting of the article to the body of the wearer is improved.

In disposable diapers, fluffy pulp has generally been used as the main material for the absorbent core and, to improve its absor-  
50 bency, various measures have been employed such as embossing and the mixing of highly absorptive polymer particles. However, the absorbing rates of the topsheet and the core are not adequately high immediately to absorb a  
55 quantity of urine as soon as said quantity of urine is excreted onto the upper surfaces of said topsheet and said core, in that the urine, at least partially, flows on the upper surface of said sheet laterally and often leaks out  
60 along the opposite side edges of the diaper. It is obvious that such a leakage will readily occur when the quantity excreted at once is relatively high.

With the invention disclosed in French Patent Publication No. 2,388,515, it is merely  
65 provided that the elastic bands are brought

into close but flat contact with the thighs of the wearer for prevention of excretion leakage. Accordingly, gaps are apt to be formed between the zones of the diaper into which said  
70 bands are incorporated and the wearer's skin when the wearing condition of the diaper deviates from the correct condition, even though such deviation is slight, or when the wearer adopts certain postures as the wearer moves.  
75 In consequence, there is a possibility that not only said laterally flowing quantity of urine but also even liquid excrement (loose passage) leaks out through said gaps.

In the case of the invention disclosed in  
80 U.S. Patent No. 4,579,556, the opposite side edges of the absorbent core are covered with a part of the impervious backsheet and thereby a certain degree of leakage protecting effect is achieved. However, as has previously  
85 been pointed out, there still remains a possibility that, when a quantity of urine is excreted at once onto the top surface of the diaper, immediately under which the absorbent core is disposed, a partial quantity of urine flows  
90 laterally on the topsheet and leaks out along the opposite side edges of the diaper before said quantity of urine is effectively absorbed by said core and blocked by said impervious side edges. Even though the side flaps are  
95 raised under the elasticity of the elastic bands on the opposite side edges of said core, these side flaps are inevitably collapsed outwardly of said side edges of said core once the diaper has been worn by the user, since  
100 said side flaps are subjected to body pressure, so that it is difficult for said leakage protecting effect to be expected.

An object of the present invention is to provide a disposable diaper permitting the afore-  
105 going problems left unsolved by said prior art to be effectively solved.

In accordance with the present invention, there is provided a disposable diaper comprising an absorbent core of a desired thickness,  
110 a water-permeable topsheet covering at least an upper surface of said core, a waterproof or a water-impervious backsheet covering at least a bottom surface of said core, water-impervious side flaps extending outwardly of opposite sides of said core, first elastic bands  
115 adapted to form elastic gathers longitudinally of the respective flaps and leakage protecting baffles formed along opposite side edges of said core to provide elastic gathers longitudinally thereof, said leakage protecting baffles  
120 being raised from upper edges of the opposite sides of said core under the elasticity of associated second elastic bands, which are longitudinally elastic.

With this structure, even when liquid excretion is absorbed by the absorbent core and then reaches the opposite side edges of said  
125 core, there occurs no leakage along the opposite sides of the core, since these opposite  
130 sides of the core are covered with the water-

proof sheet. Furthermore, even in a situation that liquid excretion overflows the top surface of the core and flows toward the opposite side edges thereof before being completely absorbed by the core, a leakage occurring along the opposite side edges of the diaper is reduced to a minimum, since there are provided at the opposite sides of the core the water-impervious leakage protecting baffles extending along the upper edges of the respective sides, which baffles respectively form the gathers and thereby prevent a leakage from occurring along these zones. Should liquid excretion flow over the leakage protecting baffles to the respective side flaps located outside thereof, the quantity of such flow is far less than the case in which there is no leakage protecting baffles and can be adequately prevented from further flowing out by the side flaps closely surrounding the thighs of the wearer under the elasticity of the elastic bands incorporated into the respective side flaps.

Although the leakage protecting baffles are apt to be outwardly tilted or collapsed under the body pressure of the wearer, the elastic bands incorporated into the respective baffles tend to maintain these baffles upstanding so as to minimize the possibility that the baffles might be disengaged from the wearer's skin to form gaps therebetween.

The second elastic bands forming parts of the leakage protecting baffles are maintained stretched to some degree so long as the diaper is put on the wearer's body, making the wearer free from any uncomfortable feeling and effectively preventing folds causing leakage from being formed in the topsheet and the core.

The invention is described further hereinafter, by way of example only, with reference to the accompanying drawings, in which:

Fig. 1 is a plan view showing an embodiment of a diaper constructed according to the present invention in its unfolded state;

Fig. 2 is a section taken along a line II-II in Fig. 1;

Figs. 3 and 4 are sections taken along a line II-II in Fig. 1, but showing other embodiments, respectively;

Fig. 5 is a plan view showing a further embodiment of a diaper according to the present invention in its unfolded state;

Fig. 6 is a section taken along a line VI-VI in Fig. 5; and

Fig. 7 is a partial section of still another embodiment of a diaper according to the present invention.

The diaper shown in Figs. 1 and 2 includes an absorbent core 1 of a desired thickness, a water-permeable topsheet 2, a waterproof or water-impervious backsheet 3, water-impervious side flaps 4, elastic bands 5 and leakage protecting baffles 6.

The topsheet 2 covers the core 1 over its

top surface and around its peripheral edge.

The backsheet 3 covers the bottom surface of the core 1 and extends outwardly beyond the peripheral edge of the core 1. The side flaps 4 comprise opposite extensions 3a of the backsheet 3 and waterproof or water-impervious sheets 7 fastened to respective top surfaces thereof.

The elastic bands 5 are made of a material such as natural or synthetic rubber or plastics, and are adhesively interposed between the associated extensions 3a and the sheets 7 together forming the respective side flaps 4. To assure a good fit of the diaper to the wearer's body, the distance between the pair of elastic bands 5 is arranged to diverge from a front zone to a rear zone of the diaper as seen in the unfolded condition of the latter, as shown in Fig. 1.

The leakage protecting baffles 6 comprise a part of the respective sheet 7 projecting upwardly in an inverted U- or  $\Omega$ -shape, containing an elastic band 9 which is longitudinally elastic. This elastic band 9 is adhesively fixed to the inner side of the projection 8 thus formed, the leakage protecting baffle 6 as a whole projecting above the upper surface of the core along the opposite sides thereof. It is preferred that the inner side of the projection 8 is intermittently fastened to the zone of the topsheet 2 located along the one of the opposite sides of the core 1 and this fastening is effected at least adjacent the upper edge of said zone. The height H of the leakage protecting baffle 6 as measured from the upper surface of the topsheet 2 corresponding to the upper edge of the opposite sides of the core 1 is 3 to 20 mm, preferably 5 to 15 mm.

The leakage protecting baffles 6 shown in Fig. 3 are folded inwardly adjacent the upper ends thereof over the opposite sides of the core 1. In this case, the folded portions of the respective baffles 6 are preferably fastened to the upper surface of the topsheet 2 at least along the corresponding upper edges of the opposite sides of the core 1. Each of the elastic bands 9 may be of a material similar to that of the band 5. Ribbon or tape of such material is transversely curved in an inverted U-shape and disposed within an upper half of the projection 8. Although it is not important that the elastic bands 9 are made of any particular material in any particular shape and whether each of them is disposed within the upper half of the projection 8 or not and whether each of them fully occupies the interior of said projection 8 or not, the elastic bands 9 are preferably disposed in the respective projections 8 adjacent the top portion thereof, so far as the elastic bands 9 present the desired elasticity. In other words, the leakage protecting baffles 6 are maintained upstanding on the upper edges of the opposite sides of the core 1 irrespective of their ma-

terial, shape and location, under a tensile force due to the contractibility of the elastic bands 9 tending to raise the respective baffles 6 into a bow-shape. It should be noted here that  
 5 each of the leakage protecting baffles 6 has its longitudinally opposite ends preferably collapsed outwardly and fixed in such condition, because the portion of the elastic band 9 defined between these opposite ends is given a  
 10 tendency to be tilted outwardly, an undesired tendency of the band 9 to be tilted inwardly when the diaper is put on the body of the wearer being avoided by this arrangement.

The core 1 comprises an absorbent retaining layer 10 consisting of fluffy pulp, fibrous web or nonwoven fabric containing highly absorptive polymers (not shown) mixed therein and an isolating layer 11 in the form of fibrous web having a relatively low density so  
 20 as to define a large vacant space therein and exhibiting a high compressive elasticity recovery rate under wet conditions. The isolating layer 11 is disposed between the topsheet 2 and the absorbent retainer layer 10 isolating  
 25 both of them from each other and allowing liquid excretion to pass rapidly therethrough. The isolating layer 11 functions not only to reduce the possibility that a quantity of liquid excretion which has been absorbed by the absorbent retaining layer 10 might flow again to the top surface of said absorbent retaining layer 10 and soak through the topsheet 2, but also to give the core 1 a cushion-like nature  
 30 so as to make the wearer free from any rigid feeling. To perform such functions adequately, the isolating layer 11 preferably comprises fibres each being of 35 to 100mm length and welded together at intersecting points to maintain the shape of a web. Individual fibres  
 40 are preferably hydrophobic fibres of which at least 50% by weight are water-absorptive (so-called sweat-absorptive), particularly sweat-absorptive polyester fibres. To facilitate the fibre welding, the fibres preferably contain at most  
 45 30% by weight of low melting point (110 to 200°C) polyester fibres, polyethylene fibres, polypropylene fibres, or conjugate fibres (side-by-side, core-sheath type) of polyethylene/polypropylene low melting point polyester/ordinary polyester. The isolating layer 11 has a thickness of 2 to 10mm as measured after being placed under a load of 3g/cm<sup>2</sup> for one minute, a weight Per unit area of 20 to 80g/m<sup>2</sup>, a compressive elasticity recovery  
 50 rate under wet conditions higher than 30%, preferably higher than 50% and a fineness of 3 to 13d.  
 55

The topsheet 2 is maintained by fibres entangled together in a configuration of non-woven fabric and provided with a plurality of  
 60 regularly arranged apertures 12 all over the surface therethrough. These apertures 12 are formed by distribution of the fibres. Each of these apertures 12 preferably has a distinct  
 65 outline without any fibres extending across

this aperture. Such a topsheet 2 is obtained, for example, by a method in which fibrous web is introduced onto a support member provided thereon with a plurality of projections  
 70 and a high velocity water stream is jetted from above onto said fibrous web so as to effect desired fibre entanglement as well as to move the fibres aside on the respective projections. For the apertures 12, each being circular and having an area of 7 to 50 mm<sup>2</sup>, a diameter of 2 to 10 mm, an array pitch of 6 to 20 mm and a total aperture ratio with respect to all the surface area of 15 to 70% are preferable. The topsheet 2 is so constructed  
 75 that the body fluids such as urine and sweat freely pass therethrough without soaking the surface of the non-apertured zone and are previously treated with a water repellent in a manner well-known in the art. It is preferred  
 80 that 70 or higher % by weight of rayon fibres having a fineness of 0.5 to 3d are contained in the topsheet 2. However, 70 or higher % by weight of said water-absorptive fibres or ordinary hydrophobic fibres may be contained  
 85 and one of the most preferable fibres is polyester fibre having a fineness of 1 to 3d. The topsheet 2 generally has a weight per unit area of 15 to 45g/m<sup>2</sup>.

The backsheets 3 comprises air-permeable  
 95 liquidresistant plastic film or laminate of the latter and fibrous nonwoven fabric.

The water-impervious sheet 7 forming a part of each side flap 4 preferably comprises an air-permeable sheet of nonwoven fabric,  
 100 particularly spunbond nonwoven fabric of polypropylene, which has been water-repellent treated.

The diaper thus constructed is, just as in the case of the well-known disposable diaper, assembled and put on the wearer's body by fastening the free ends of tape fasteners 13  
 105 mounted on the opposite sides of the rear zone at a level of the waist line to the opposite sides of the backsheets 3 in the front zone.

Fig. 4 shows an embodiment of the present invention in which the sheet 7 forming a part of each side flap 4 partially projects in an inverted U- or n-shape and a projection 14  
 115 thus formed contains therein an elastic band 5 transversely curved in an inverted U-shape so as to form a leakage protecting baffle 15. This baffle 15, as in the case of the previously mentioned leakage protecting baffle 6, also has its height H and its longitudinally opposite ends preferably outwardly collapsed and fixed.  
 120

Figs. 5 and 6 show another embodiment of the present invention in which each of the  
 125 side flaps 4 is tapered from the rear zone to the front zone and each of the elastic bands 5 is disposed between an extension 3a of the backsheets forming the side flap 4 and the sheet 7. The distance between the pair of the elastic bands 5 is correspondingly reduced  
 130



from the rear zone to the front zone of the diaper and the front portions of the bands 5 are located on the bottom edges of the opposite sides of the core 1 and intersect them.

- 5 However, these front portions may be adjacent, instead of intersecting them.

It should be understood that the opposite side edges of the topsheet 2 may, as seen in Fig.7, extend outwardly. Furthermore, the leak-

- 10 age protecting baffles 6 and 15 may be disposed at least in the crotch area of the diaper.

#### CLAIMS

- 15 1. A disposable diaper comprising an absorbent core of a desired thickness a water-permeable topsheet covering at least an upper surface of said core, a waterproof or a water-impervious backsheet covering at least a bot-  
20 tom surface of said core, water-impervious side flaps extending outwardly of opposite sides of said core, first elastic bands adapted to form elastic gathers longitudinally of the respective flaps and leakage protecting baffles  
25 formed along opposite side edges of said core to provide elastic gathers longitudinally thereof, said leakage protecting baffles being raised from upper edges of the opposite sides of said core under the elasticity of associated  
30 second elastic bands, which are longitudinally elastic.

2. A diaper as claimed in claim 1, wherein each of said leakage protecting baffles has a height of at least 3mm as measured from the  
35 top surface of said topsheet located on the upper edges of the opposite sides of said core.

3. A diaper as claimed in claim 1 or 2, wherein a waterproof or a water-impervious  
40 sheet forming said leakage protecting baffle is intermittently fastened to said topsheet at locations on the opposite sides of said core.

4. A diaper as claimed in claim 1, 2 or 3, wherein said leakage protecting baffles com-  
45 prise a part of said waterproof or said water-impervious sheet covering the opposite sides of said core, each projecting in an inverted U- or  $\Omega$ -shape, each projection thus formed containing, at least within its top portion, said  
50 second elastic band.

5. A diaper as claimed in claim 1, wherein the distance between the pair of said first elastic bands is reduced from the rear zone to the front zone of the diaper.

- 55 6. A diaper as claimed in claim 1, wherein said first elastic bands are located so that the distance therebetween is gradually reduced from the rear zone to the front zone of the diaper and the front portions thereof are adja-  
60 cent or intercept the front portions of said second elastic bands.

7. A diaper as claimed in claim 1, wherein an upper layer of said core comprises an isolating layer having a fibre density lower than  
65 that of a lower layer and containing therein a

large vacant space.

8. A diaper as claimed in claim 1, wherein said topsheet is provided, at least in its zone located on said core, with a plurality of aper-  
70 tures.

9. A disposable diaper substantially as here-  
inbefore described with reference to and as illustrated in the accompanying drawings.

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